

Advanced Airway Techniques



Introduction

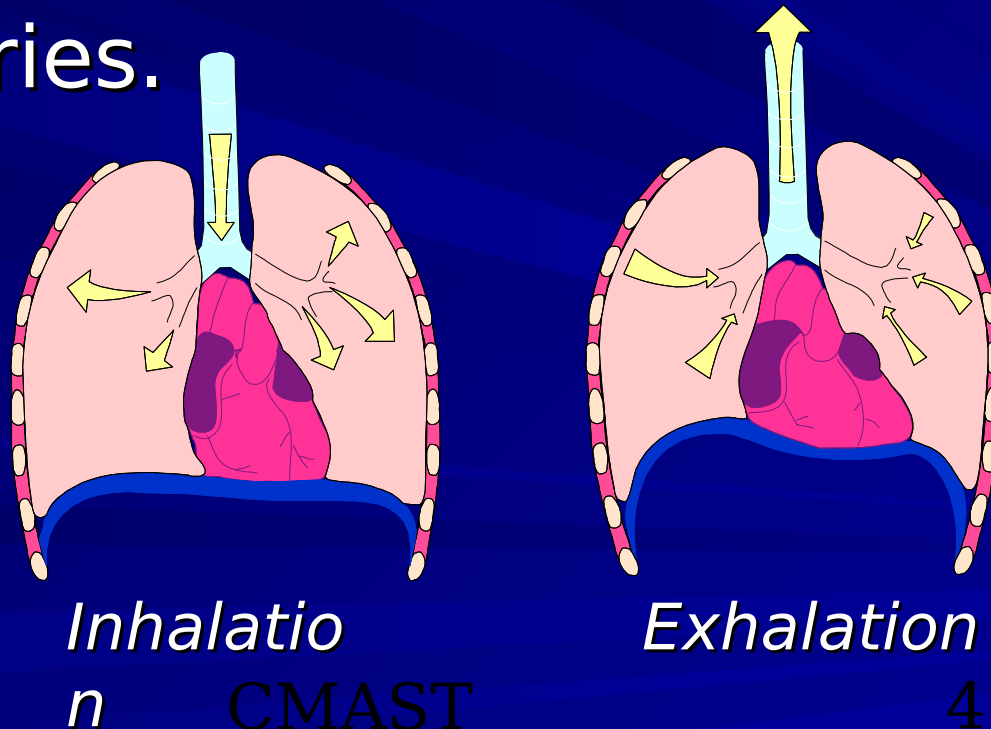
- One of the most critical skills for the soldier medic.
- Without proper airway management and ventilation techniques, casualties may die.
- Must be able to choose and effectively utilize the proper equipment for ventilation in a tactical environment.

Review the Physiology

- Inhalation (an active process):
 - Initiated by contracting of respiratory system muscles
 - Diaphragm contracts and drops downward
 - Intercostal muscles contract, chest expands
 - Intrathoracic pressure falls, pulling air into lungs
- Exhalation (a passive process):
 - Respiratory muscles relax; diaphragm moves upward
 - Chest wall recoils
 - Intrathoracic pressure rises
 - Air is pushed out

Gas Exchange

- Alveoli supply O^2 to, and remove CO^2 from the lungs.
- Exchange is made by diffusion across the cell wall of the alveoli and capillaries.

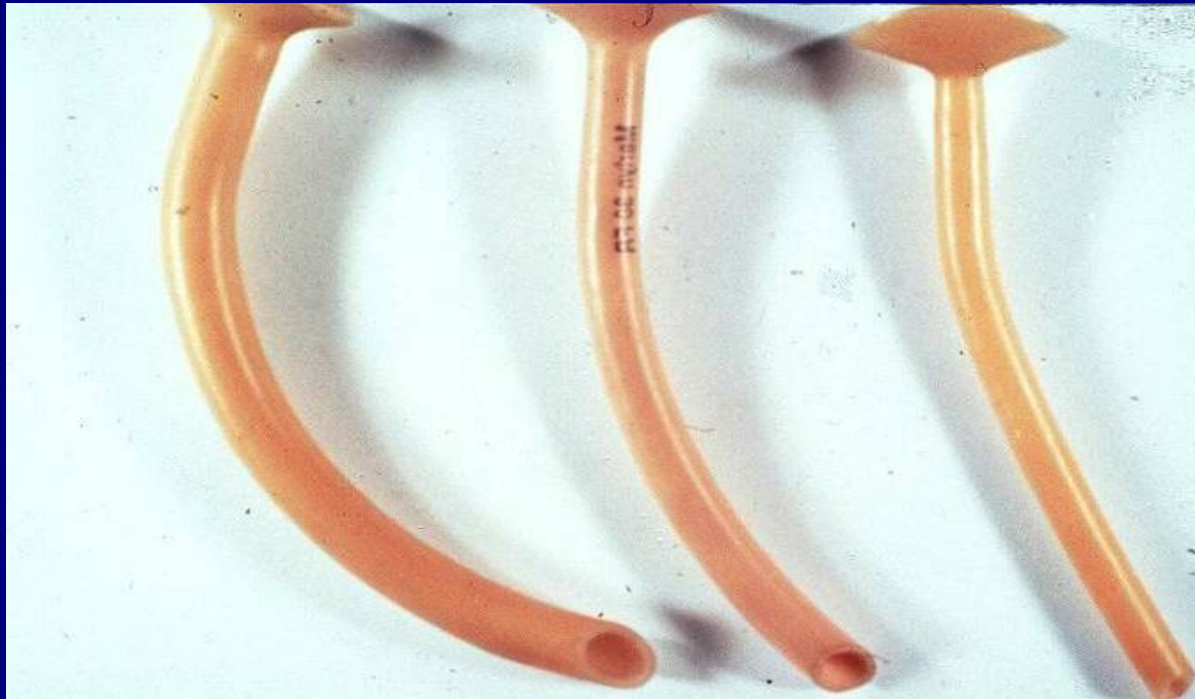


Sources of Airway Obstruction

- Tongue:
 - Most common cause of airway obstruction
- Foreign body airway obstruction (FBAO).
- Trauma/Combat:
 - Loose teeth, facial bone fractures, fractured larynx
- Laryngeal spasm:
 - Edema can severely obstruct airflow
- Aspiration.

Nasopharyngeal Airway

- Insert a nasopharyngeal airway (NPA) adjunct.



Nasal Airway Adjunct

- Do not use if roof of mouth is fractured or brain matter is exposed.
- Purpose:
 - To maintain an artificial airway for oxygen therapy or airway management

Nasal Airway Adjunct

- Indications:
 - Conscious, semi-conscious or has an active gag reflex
 - Injuries to mouth
 - Seizure casualties
 - Likely vomiting

Nasal Airway Adjunct

- Contraindications:
 - Injuries to roof of mouth
 - Exposed brain matter
 - Drainage of CSF from nose, mouth or ears

Nasal Airway Adjunct

- Complications:
 - Nasal trauma
 - Bloody nose, minor tissue trauma (most common)
 - May trigger gag reflex if NPA is too long



CMAST

Nasopharyngeal Insertion

- Procedures:
 - Supine position on firm surface – C-spine stabilized
 - Select proper size NPA
 - Diameter – smaller than the casualty's nostril; approximately diameter of casualty's little finger
 - Length - Measure from tip of nose to earlobe

Nasopharyngeal Insertion

- Procedures:
 - Lubricate the NPA with a water soluble lubricant



Nasopharyngeal Insertion

- Procedures:
 - Place head into a neutral position;
extend nose



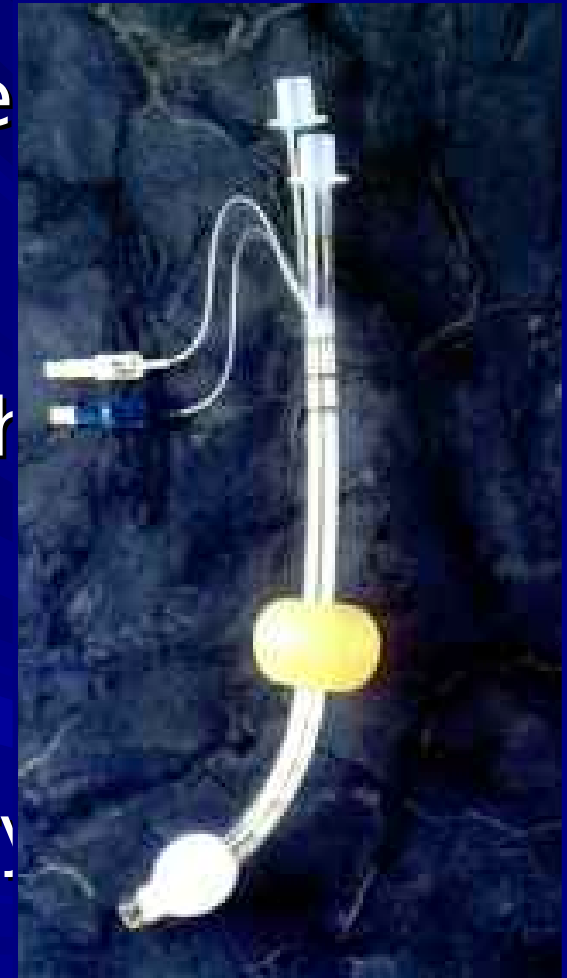
Nasopharyngeal Insertion

- Procedures:
 - Insert tip of the NPA through the R nostril; if resistance is met, insert into the other nostril
 - Place casualty in recovery position



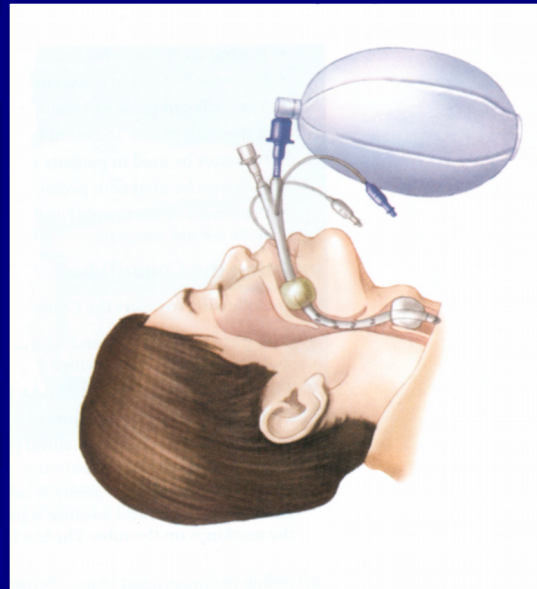
Combitube

- Esophageal-tracheal double lumen airway.
- Blind insertion.
- Successful in casualties with
 - Trauma
 - Upper airway bleeding and vomiting
- Effective in cardiopulmonary resuscitation.



Combitube

- Double-lumen design allows for effective ventilations regardless if in the trachea or esophagus.
- Comes in two sizes:
 - 37 Fr
 - 41 Fr



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Combitube

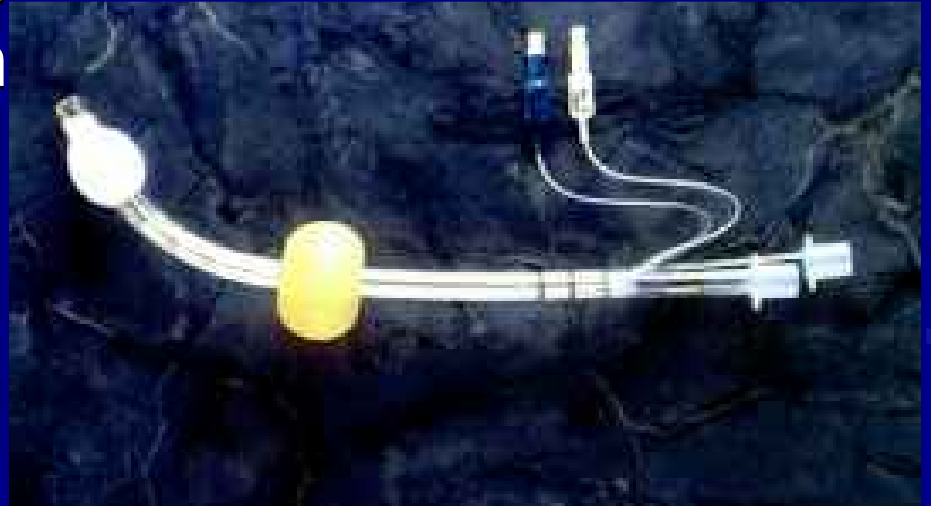
- Indications:
 - Adult casualties in respiratory distress
 - Adult casualties in cardiac arrest
- Contraindications:
 - Intact gag reflex
 - Casualties less than 5 feet in height
 - Known esophageal disease
 - Caustic substance ingestion

Combitube

- Side effects and complications:
 - Sore throat
 - Dysphagia
 - Upper airway hematoma
- Esophageal rupture (rare).
- Preventable by avoiding over-inflation of the distal and proximal cuffs.

Combitube

- Intubation procedures:
 - Inspect the upper airway for visible obstructions
 - Hyperventilate ($> 20/\text{min}$) for 30 seconds
 - Casualty in neutral head position
 - Test both cuffs:
 - 15 ml (white)
 - 100 ml (blue)

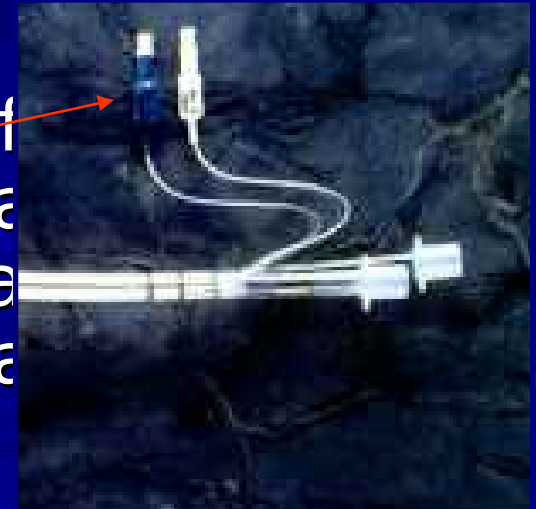


Combitube

- Intubation procedures:
 - Insert in same direction as the natural curvature of the pharynx
 - Grasp tongue and lower jaw between thumb and index finger, lift upward (jaw-lift)
 - Insert gently but firmly until black rings are positioned between casualty's teeth
 - Do not force – if does not insert easily, withdraw and retry
 - Hyperventilate between attempts

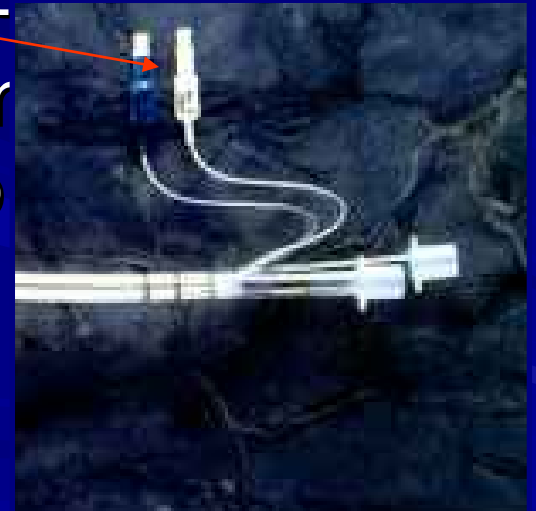
Combitube

- Intubation procedures:
 - Inflate #1 (blue) pilot balloon with 100 ml of air (100 ml syringe)
 - Inflate #2 (white) pilot balloon with 15 ml of air (20 ml syringe)
 - Ventilate through the primary #1 blue tube; if auscultation of breath is positive (gas exchange is negative) continue to ventilate



Combitube

- Intubation procedures:
 - If auscultation of breath sounds is negative and gastric sounds is positive, immediately begin ventilations through the shorter (white) ~~connecting tube (#2)~~
 - Confirm tracheal ventilation of breath so absence gastric insufflation



Combitube

- Intubation procedures:
 - If auscultation of breath sounds and auscultation of gastric insufflation is negative, the Combitube® may have been advanced too far into the pharynx
 - Deflate the #1 balloon/cuff, and move the Combitube® approx. 2-3 cm. out of the casualty's mouth
 - Re-inflate the #1 balloon and ventilate through the longer (#1) connecting tube; if auscultation of breath sounds is positive and auscultation of gastric insufflation is negative – continue to ventilate.
 - If breath sounds are still absent – extubate

Combitube

- Combitube removal.
- Should not be removed unless:
 - Tube placement cannot be determined
 - Casualty no longer tolerates the tube
 - Casualty vomits past either distal or pharyngeal tube
 - Palpable pulse and casualty breathing on their own
 - Physician or PA is present to emplace ETT

Combitube

- Combitube removal.
 - Have suction available and ready
 - Logroll casualty to side (unless spinal-injured)
 - Deflate the pharyngeal cuff (#1 pilot balloon)
 - Deflate the distal cuff (#2 pilot balloon)
 - Gently remove Combitube® while suctioning

Emergency Cricothyrotomy

- Indications:
 - Inability to ventilate a casualty with NPA or Combitube secondary to:
 - Severe maxillofacial injury, airway obstruction and structural deformities
 - Emergency airway catheters with a 6 mm diameter allow for spontaneous breathing and adequate oxygenation in adults

Emergency Cricothyrotomy

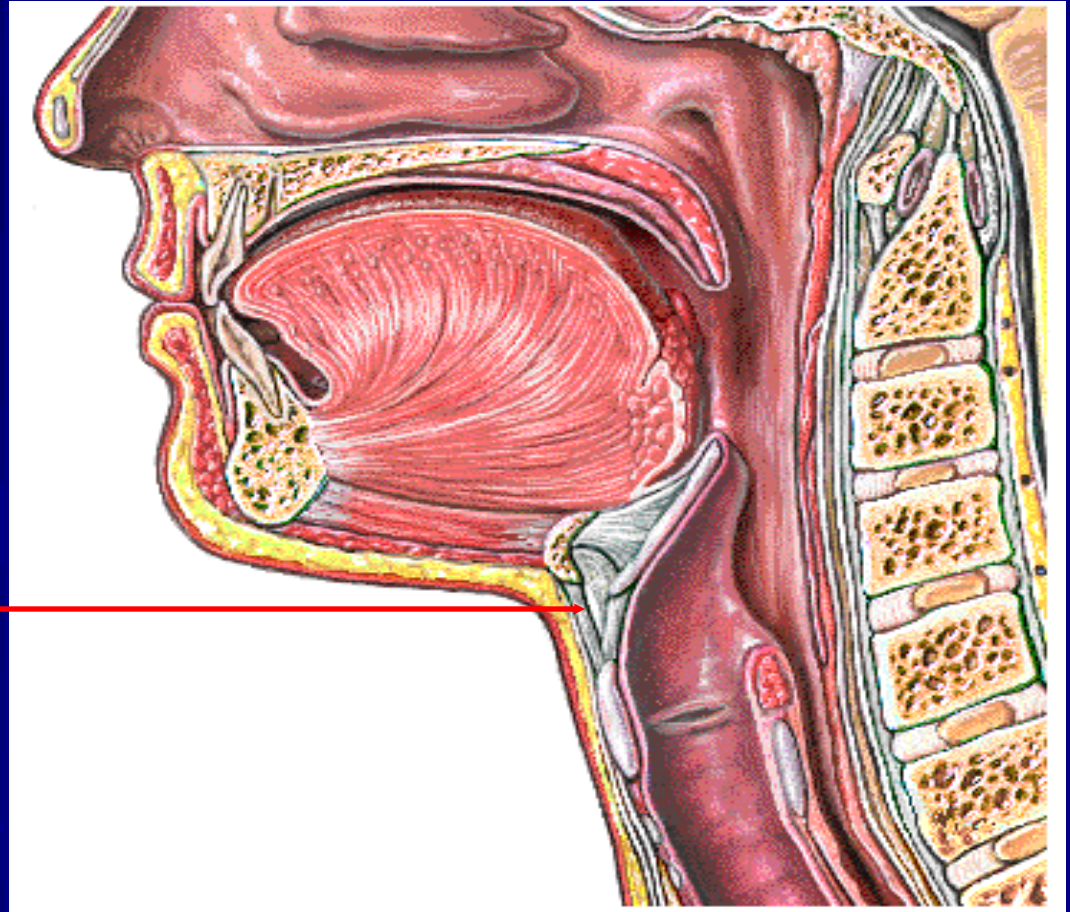
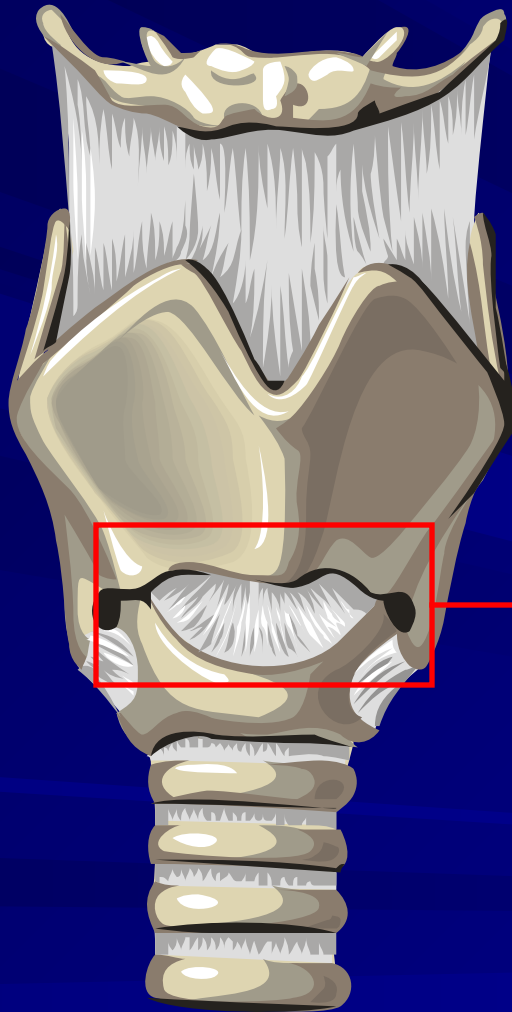
- When maxillofacial, cervical spine, head or soft tissue injuries are present, several factors may prevent ventilation:
 - Gross distortion
 - Airway obstruction
 - Massive emesis
 - Significant hemorrhage



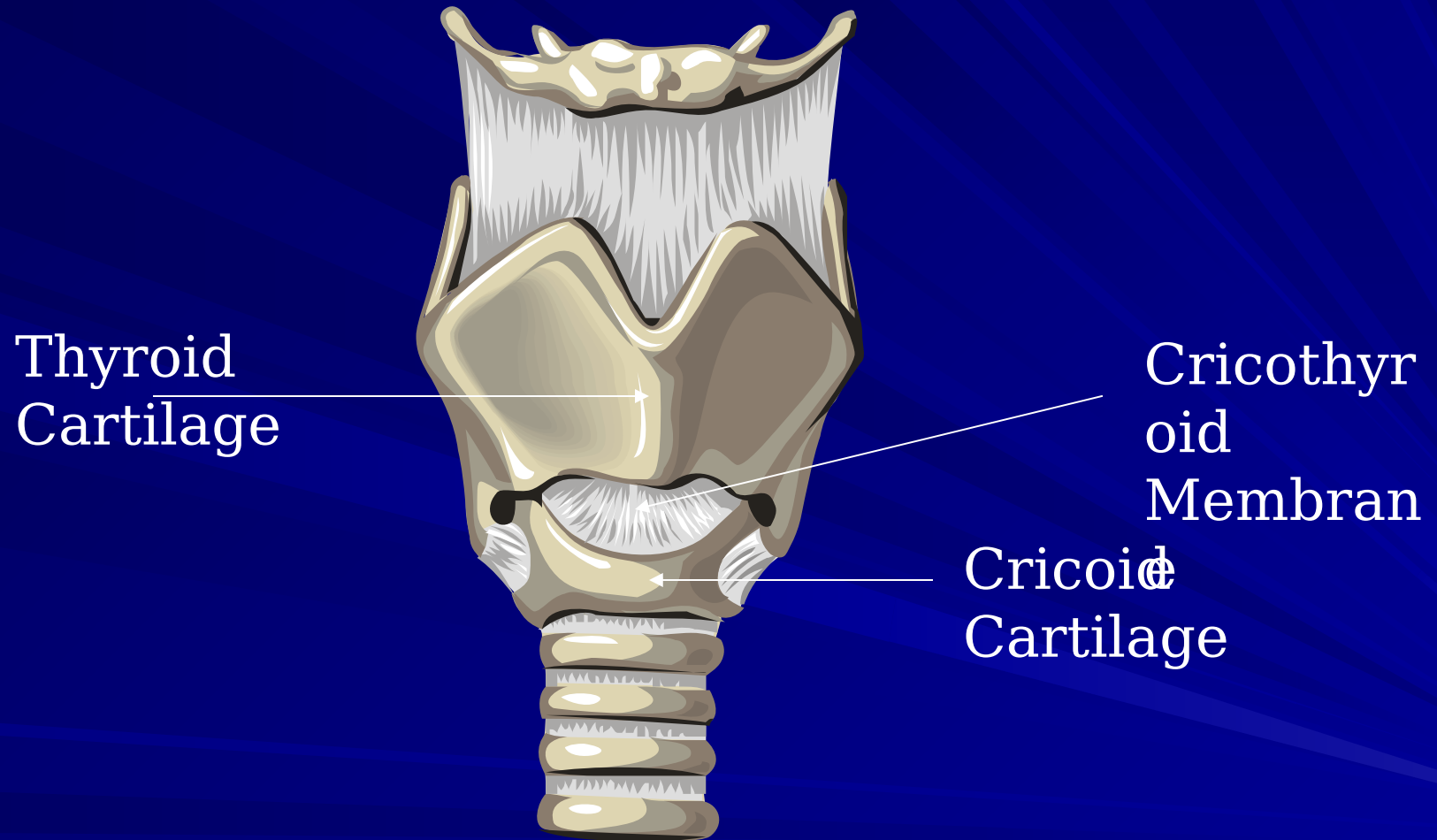
Emergency Cricothyrotomy

- Complications:
 - Incorrect tube placement
 - Blood aspiration
 - Esophageal laceration
 - Hematoma
 - Tracheal wall perforation
 - Vocal cord paralysis, hoarseness

Larynx

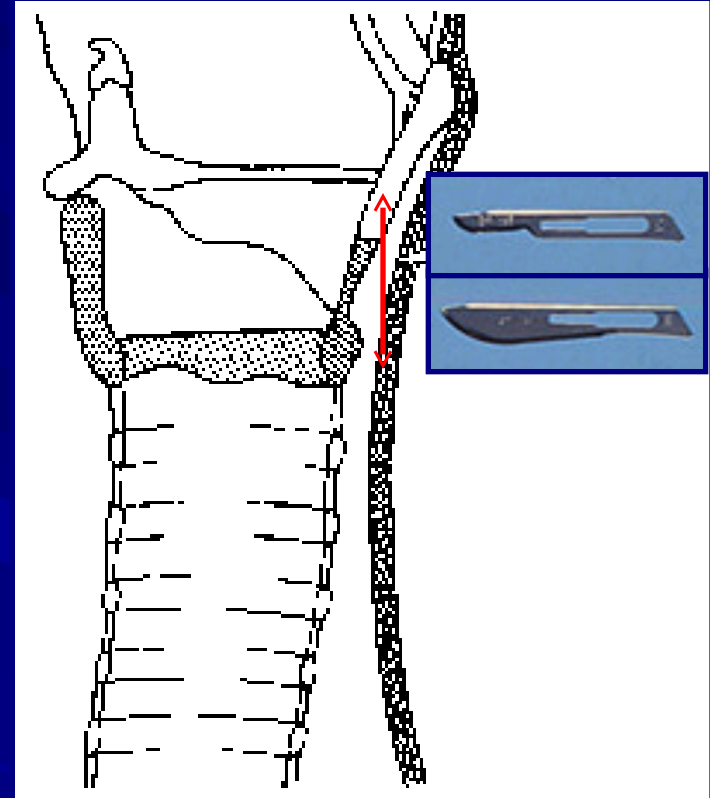


Cricothyroid Membrane



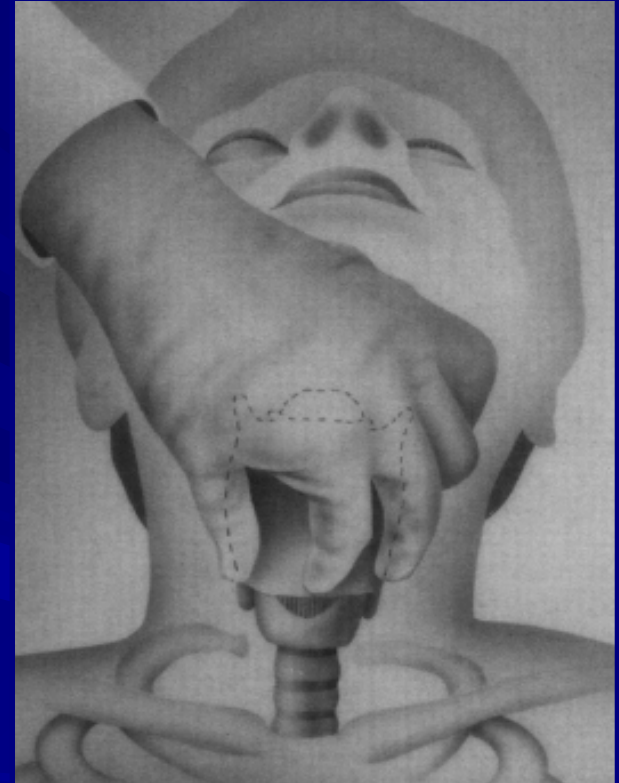
Emergency Cricothyrotomy

- Procedure:
 - Identify and palpate the cricothyroid membrane
 - Make a 1 ½-inch vertical incision in the midline using a #15 or #10 scalpel blade



Emergency Cricothyrotomy

- Procedure:
 - Stabilize the larynx with one hand; using a scalpel or hemostat, cut or poke through the cricothyroid membrane
 - A rush of air may be felt through the opening



Emergency Cricothyrotomy



Emergency Cricothyrotomy

- Insert the end of the ET tube into the trachea directed towards the lungs and inflate the cuff with 5-10 ml of air
- Advance the tube no more than 2-3 inches; further intubation could result in right main stem bronchus intubation only



Emergency Cricothyrotomy

- Check for air exchange and tube placement:
 - Listen and feel for air passing in and out of tube
 - Look for bilateral rise and fall of the chest
 - Ascultate the abdomen and both lung fields

Emergency Cricothyrotomy

- Indications of proper placement:
 - Unilateral breath sounds and rise and fall of the chest (right main stem intubation); deflate cuff and retract 1-2 inches and recheck airway
 - Air coming out of the casualty's mouth (tube pointing away from lungs); remove tube and reinsert with tube facing lungs

Emergency Cricothyrotomy

- If casualty is not breathing spontaneously direct someone to perform rescue breathing:
 - Connect tube to BVM and ventilate at 20 breaths per minute
 - No BVM available, perform mouth-to-tube resuscitation at 20 breaths per minute
 - Tube must be secured once rescue breathing has started

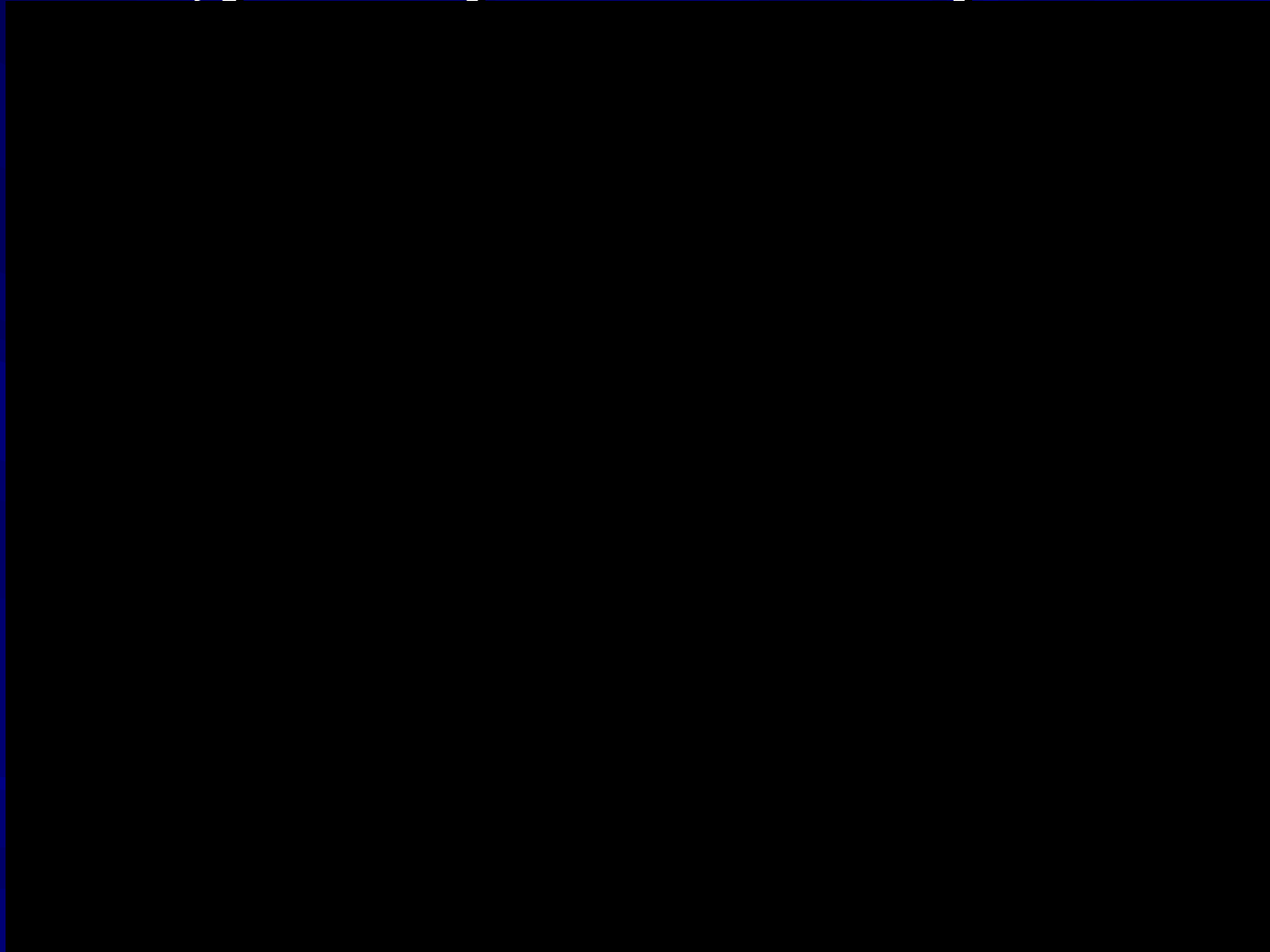
Emergency Cricothyrotomy

- Apply dressing to protect the tube and incision site:
 - Cut two 4x4 gauze sponges halfway through and place on opposite sides of tube; tape securely
 - Or apply two 4x4 gauze dressing in a “V” shape fold at the edges of the cannula and tape securely

Emergency Cricothyrotomy

- Monitor casualty's respirations on a regular basis.
 - Reassess air exchange and tube placement every time the casualty is moved
 - Assist with respirations if rate falls below 10 or above 24 per minute

Emergency Cricothyrotomy



Click in box for video

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Summary

- Airway compromise is a small percentage of combat casualties.
- Airway management must be readily available and rapidly applied.
- Airway compromise is the third leading cause of preventable death on the battlefield.

Questions?

